

TWO NEW SPECIES OF THE GENUS *OPHRYOTROCHA* (POLYCHAETA, IPHITIMIIDAE) FROM KAGOSHIMA BAY

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ABSTRACT

Two new species of the genus *Ophryotrocha* were recorded from soft bottoms of about 200-m depth in Kagoshima Bay, southern Japan. *Ophryotrocha kagoshimaensis* is morphologically very close to a known viviparous species, *O. vivipara*, in having only six setigers. The former differs from the latter in brooding two to four embryos or larvae partially extruded from the posterior segments instead of having eight embryos including two larvae within the middle segments. *O. wubaolingi* sp. n. has branchia-like projections on both dorsal and ventral bases of parapodia and dorso-ventrally depressed segments. These morphological characters are shared by *O. platycephale* from Guaymas Basin. The new species, however, has compound falcigers and thus differs from the latter which has compound spinigers.

Kagoshima Bay is formed by two gigantic calderas, the Aira and the Ata. The last eruption of the Aira Caldera occurred 22,000 years ago. The volcanic activity still continues in the northern part of the bay as submarine fumaroles called “Tagiri,” meaning boiling or bubbling, by local fishermen. The gas released from these hydrothermal vents contains more than 80 by volume % of carbon dioxide, about 15% of methane, and 0.07–0.47% of hydrogen sulfide (Ossaka et al., 1992). The seawater around the vents sometimes becomes less than pH 6. These unique environmental characters may also have a strong effect on the benthic fauna of Kagoshima Bay, however the polychaete fauna is poorly known. In this study, two species of the genus *Ophryotrocha* Claparède and Mecznirow, 1869 are reported from the northern part of Kagoshima Bay.

Orensanz (1990) proposed to transfer the genus *Ophryotrocha* to the family Iphitimidae to avoid the paraphyletic relationships among the families Dinophilidae, Iphitimidae, and Dorvilleidae. Here we adopt his proposed system at the family level for the genus *Ophryotrocha*. The genus was thought to be ill-defined and its diagnosis was emended differently by Orensanz (1990) and by Hilbig and Blake (1991). Orensanz erected some new genera; however Hilbig and Blake thought it impossible to split the genus into less heterogeneous new genera. In this study, the species from Kagoshima Bay is compared with other known species of the genus *Ophryotrocha* sensu lato, i.e., sensu Hilbig and Blake, 1991.

MATERIAL AND METHODS

The specimens were collected at two different sites of the bay-head area of Kagoshima Bay. One is the hydrothermal vent site where a biological dredge of about 1-m width was used to obtain bottom sediment. The sediment was sieved through a 0.5-mm mesh screen. The other site is about 1000 m distant from the vent site. At this site, a saturation diving system was used to clarify the colonization of benthic organisms in an organically enriched sediment. The experimental sediments were exposed on the bottom during 2 days. Exposed sediments were sieved through a 0.1-mm mesh screen to collect newly colonizing benthic organisms or their larvae.

The types and additional specimens are deposited at the National Science Museum, Tokyo (NSMT), Kagoshima University (KU), the U.S. National Museum of Natural History, Smithsonian Institution (USNM) and the Los Angeles County Museum of Natural History (LACMNH).

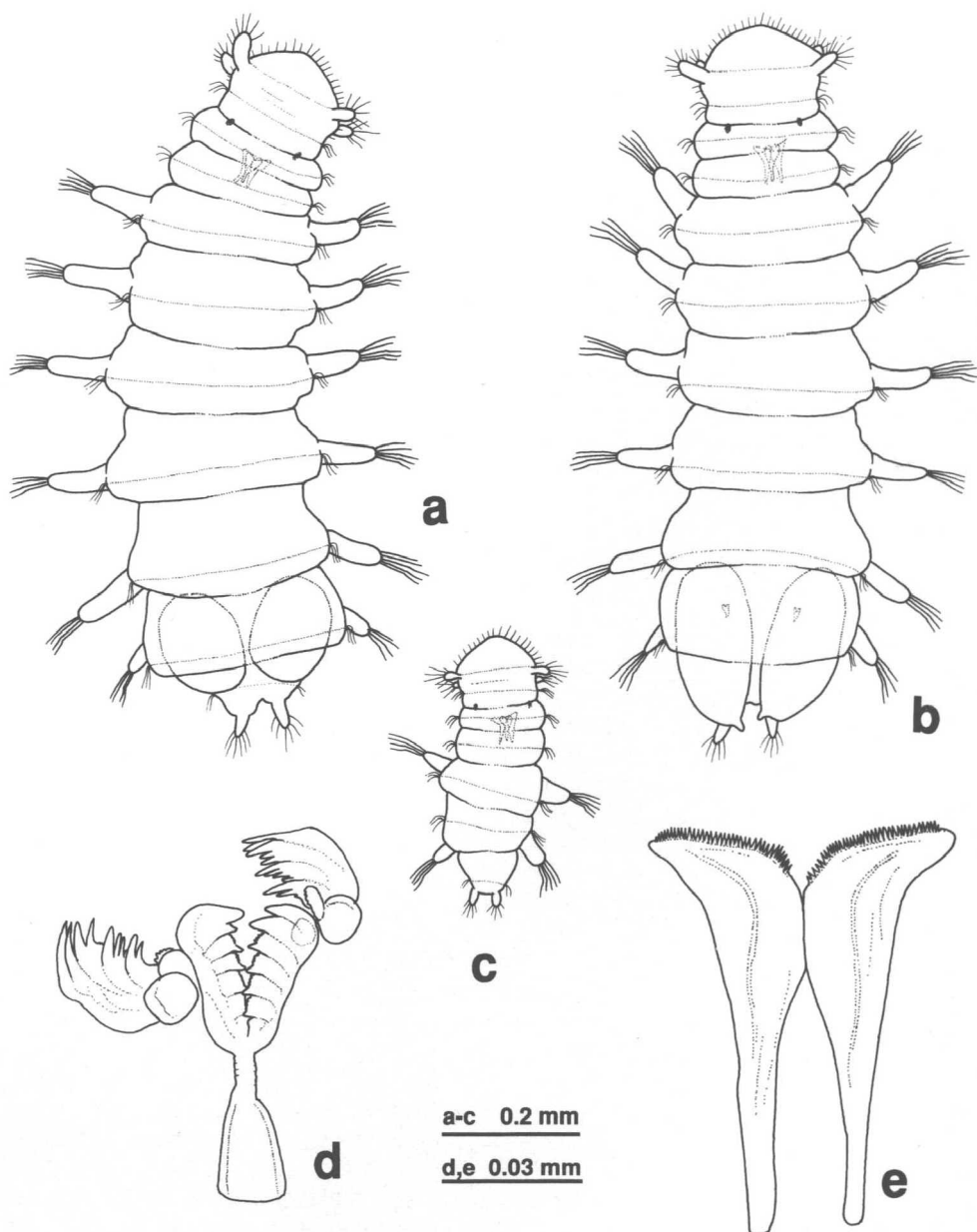


Figure 1. *Ophryotrocha kagoshimaensis*, new species. a. Ovigerous specimen drawn from a photographed living specimen; b. Lavigerous stage drawn from a photo; c. 10-day old larva; d. Maxillae of an ovigerous adult; e. Mandibles of the same.

***Ophryotrocha kagoshimaensis* new species**

Figure 1

Material Examined.—Experimental sediment, non-vent site, Kagoshima Bay, 197 m, April 2, 1991, R/V KAIYO-MARU, 31°39.8'N, 130°45.6'E, by Saturation Diving, holotype (NSMT-Pol. H-358), 10 paratypes (USNM 172810), 10 paratypes (LACM-AHF 1848-1850), additional specimens (KU).

Description.—Living larvigerous female from Kagoshima Bay 1 mm long, 0.3 mm wide excluding parapodia, with 6 setigers. Body transparent, with dark jaw apparatus.

Prostomium wider than long, rounded in front, with two pairs of short antennae, two ciliary bands anterior and posterior to prostomial antennae, and a pair of dark eyes on posterior margin (Fig. 1a, b).

Peristomium consisting of two equally long achaetous and apodous rings, shorter than prostomium; each ring with single ciliary band. Mandibles as large as maxillae, with serrated cutting edges. Maxillae p-type, consisting of Y-shaped forceps with single rectangular carrier and forceps subdivided into 6–8 large teeth, four pairs of strong denticles, and three pairs of rounded dental plates (Fig. 1d, e).

Setigerous segments, only six, wider and longer than peristomium. First five setigers with similar parapodia. Last setiger with smaller parapodia, slightly longer than anterior setigers. Posterior end of setiger 6 extended dorsally and ventrally, forming membranous eggholds. Each setiger with single ciliary band posterior to parapodia (Fig. 1a, b). Parapodia simple without dorsal or ventral cirrus. Each parapodium with simple setae and compound spinigers. Pygidium rounded, with pair of short anal cirri and single anal ciliary band. Embryos brooded beneath posterior fold of last setiger, one to two pairs.

Biology.—No male specimen could be recognized in the 50 fixed and 23 living specimens. Living specimens were maintained for about 50 days at room temperature between 15–25°C, whereas the sampling site was about 16°C in water and mud temperatures. The worms were kept in four bottles filled with filtered seawater and fed several flakes of TetraMin when the water was changed every 3 days. Among 23 specimens cultured, only three were alive after 50 days, the remaining were dead presumably due to the warm water temperature. During the first 30 days, the temperature was lower than 20°C and some larvae were released.

The mature female measured about 1 mm long for six setigers and had four eggs within setigers 4 and 5. The eggs grew larger in the coelom, though no more development could be observed. In some cases, the four eggs were abnormally divided into eight, and a few days later, the eggs began to be reabsorbed.

At the beginning of rearing, three specimens brooded eggs in their pygidial regions. The female held two or four eggs between setiger 6 and the pygidium. The posterior halves of eggs protruded into the surrounding water beyond the posterior fold of setiger 6 (Fig. 1a, b). Thus the specimens from Kagoshima Bay are not thought to be truly viviparous, although the embryos were brooded until they would become 2-setiger larvae with a jaw apparatus (Fig. 1a). The length of the brooding period is unknown, but must be at least 20 days, since the last larvae were released 19 days after sampling. The newly released larvae were about 0.25 mm long by 0.15 mm wide with two setigers. The larvae grew slowly (Fig. 1c, 10-day old larva) and had three setigers 2 weeks after being released.

Remarks.—Among more than 30 species of the genus *Ophryotrocha* sensu lato (sensu Oug, 1994 and also sensu Hilbig and Blake, 1991, but not sensu Orensanz, 1990), a single species, *O. vivipara* Banse, 1963 has been known to be viviparous with only six setigers in adults. The new species is morphologically very close to *O. vivipara*, but differs in reproductive behavior. *Ophryotrocha vivipara* have been observed carrying two 2-setiger embryos within setigers 3–5, whereas in *O. kagoshimaensis*, embryos before larval stage (two or four developing eggs)

are brooded on the posterior end of the body, partially protruding into the surrounding water. The original description of *O. vivipara* was based on observations of only two type specimens by Banse (1963). Åkesson (1994) observed about 50 Swedish specimens of *O. vivipara* and reported the same reproductive behavior as the original description. The Swedish specimens were reexamined and compared with *O. kagoshimaensis*. Some Swedish specimens had inflated middle bodies with developing larvae as figured by Banse (1963). On the other hand, no specimen of *O. kagoshimaensis* was inflated.

***Ophryotrocha wubaolingi*, new species**

Figure 2

Material Examined.—Vent site (around submarine fumaroles), Kagoshima Bay, 200 m, May 28, 1984, 31°39.5'N, 130°46.4'E, Biological Dredge, holotype (NSMT-Pol. H-357, ovigerous female), five paratypes (USNM 172809), five paratypes (LACM-AHF 1843–1847), seven specimens (KU).

Description.—Holotype ovigerous female, 7.2 mm long, 0.9 mm wide excluding parapodia, with 53 setigers, lacking some caudal segments. Largest paratype complete, 9.2 mm long, 0.8 mm wide, with 62 setigers (Fig. 2a).

Prostomium much wider than long, indistinctly annulated, slightly notched anteriorly, thickened laterally, flattened dorsally, with three ventral grooves; antennae cirriform, tapering; palps with tapering palpostyle and short palpopore. Peristomium consisting of two apodous rings, longer than prostomium (Fig. 2b, c).

Parapodia uniramous, truncate distally, with short papilliform dorsal cirri, lacking distinct ventral cirri, bearing remarkably inflated dorsal and ventral branchia-like ciliate projections (Fig. 2e). Setae of two kinds; compound falcigers in subacicular fascicle, more than 10 per parapodium, with blunt-tipped serrated blades and serrated shafts (Fig. 2h); simple setae in supraacicular fascicle, more than 10 per parapodium, blunt-tipped, serrated (Fig. 2i).

Mandibles with numerous distinct teeth on very broad cutting edge (Fig. 2g), about one-third smaller than maxillae. Maxillae K-type in holotype, consisting of large heavily chitinated icetong-shaped forceps, three pairs of superior strong denticles, and four pairs of inferior rounded dental plates (Fig. 1f).

Pygidium rounded, with 2 long anal cirri (Fig. 2d).

Etymology.—The species is named in honor of Professor Wu, Bao-Ling who was one of the co-conveners of the fifth International Polychaete Conference in Qingdao, but unfortunately was confined to a hospital during the meeting.

Remarks.—*Ophryotrocha platykephale* Blake, 1985, *O. lobifera* Oug, 1978, and *O. wubaolingi* differ from other congeneric species in having branchia-like structures at both the dorsal and ventral bases of the parapodia. *Ophryotrocha lobifera* Oug, 1978 differs from the other two species in having both of prominent dorsal and ventral cirri. *Ophryotrocha platykephale* was redescribed by Solis-Weiss and Hilbig (1992) since the parapodia were not described correctly by Blake (1985). *Ophryotrocha platykephale* and *O. wubaolingi* share unique morphological characters such as the long, thin palps and antennae, and a dorso-ventrally flattened head, but differ from each other by the shape of compound setae and the structure of maxillary apparatus. The new species has compound falcigers and a smooth inner edge of the maxillary forceps, however *O. platykephale* has compound spinigers and a dentate inner edge of the forceps.

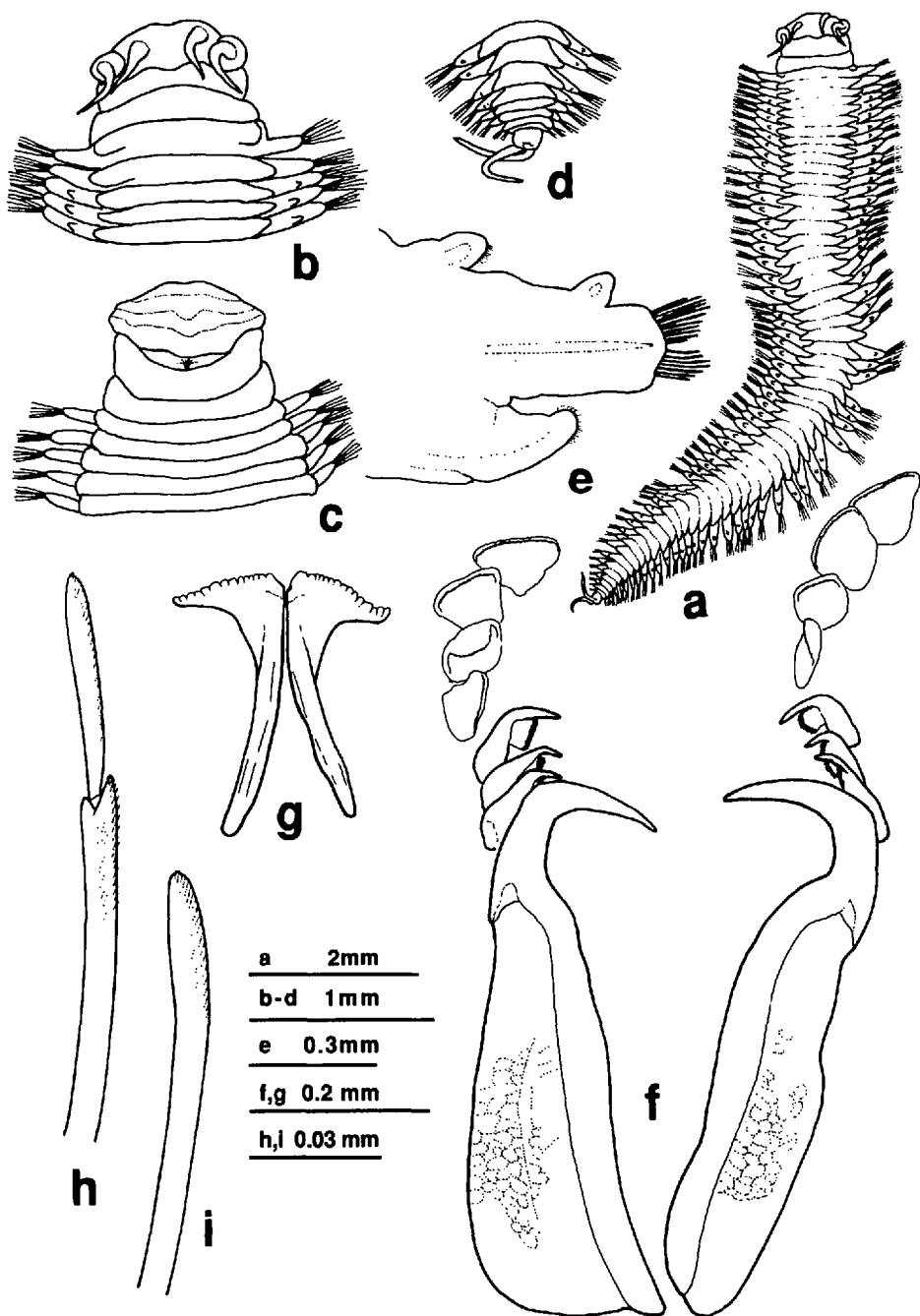


Figure 2. *Ophryotrocha wubalingi*, new species. (Paratype): a. Whole body, dorsal view; b. Anterior end, dorsal view; c. The same, ventral view; d. Posterior end, dorsal view; (Holotype): e. Parapodium 9, posterior view; f. Maxillae; g. Mandibles; h. Compound falciger; i. Simple seta.

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LITERATURE CITED

- Åkesson, B. 1994. Evolution of viviparity in the genus *Ophryotrocha* (Polychaeta, Dorvilleidae). *Mém. Mus. Nat. Hist. Natr.* 162: 29–35.
- Banse, K. 1963. Polychaetous annelids from Puget Sound and the San Juan Archipelago, Washington. *Proc. Biol. Soc. Wash.* 76: 197–208.
- Blake, J. A. 1985. Polychaeta from the vicinity of deep-sea geothermal vents in the eastern Pacific. *Bull. Biol. Soc. Wash.* 6: 67–101.
- Claparède, E. and E. Mecznirow, 1869. Beiträge zur Kenntnis der Entwicklungsgeschichte der Chaetopoden. *Z. Wiss. Zool.* 19: 163–205.
- Hilbig, B. and J. A. Blake. 1991. Dorvilleidae (Annelida: Polychaeta) from the U.S. Atlantic slope and rise. Description of two new genera and 14 new species, with a generic revision of *Ophryotrocha*. *Zool. Scr.* 20:147–183.
- Ossaka, J., J. Hirabayashi, K. Nogami, M. Kurosaki and J. Hashimoto. 1992. Variation of chemical composition of volcanic gases from the northern part of Kagoshima bay. *Proc. JAMSTEC Symp. Deep Sea Res.* 8:75–80.
- Orensanz, J. M. 1990. The Eunicemorph polychaete annelids from Antarctic and subantarctic seas. With addenda to the Eunicemorpha of Argentina, Chile, New Zealand, Australia, and the Southern Indian Ocean. *Antarct. Res. Ser.* 52: 1–183.
- Oug, E. 1978. New and lesser known Dorvilleidae (Annelida, Polychaeta) from Scandinavian and Northeast American waters. *Sarsia* 63: 285–303.
- . 1994. The genus *Ophryotrocha* *sensu lato* (Polychaeta, Dorvilleidae) in the Tromsø area, northern Norway. *Mem. Mus. Natn. Hist. Nat.*, 162: 251–257.
- Solis-Weiss, V. and B. Hilbig. 1992. Redescription of *Ophryotrocha platycephale* Blake, 1985 with additional remarks on systematics and ecology. *Bull. Southern Calif. Acad. Sci.* 91: 92–96.

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